



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/046,979	01/17/2002	Yoshiaki Toyota	ASA-1050	5404

7590

10/27/2003

MATTINGLY, STANGER & MALUR, P.C.
Suite 370
1800 Diagonal Road
Alexandria, VA 22314

EXAMINER

DUONG, THOI V

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 10/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AA

Office Action Summary

Application No.

10/046,979

Applicant(s)

TOYOTA ET AL.

Examiner

Thoi V Duong

Art Unit

2871

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 January 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-13 is/are allowed.
- 6) ☒ Claim(s) 1-10, 14 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 21 July 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This office action is in response to the Amendment, Paper No. 6, filed July 21, 2003.

Accordingly, claims 1, 11 and 14 were amended. Currently, claims 1-15 are pending in this application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-5, 10, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (USPN 5,814,529) in view of Hwang (USPN 6,545,730 B1).

As shown in Figs. 1A-1E, Zhang discloses a manufacturing method of an image display (as well as a liquid crystal display device), comprising the steps of:

- forming a plurality of island-shaped semiconductor layers onto a substrate 101;
- forming a first insulation film 104 onto said island-shaped semiconductor layers;
- forming a gate electrode 106 and a storage electrode 107 onto said first insulation film;

- forming a source region, a drain region 103, and a channel region sandwiched between them onto said island-shaped semiconductor layers;

- forming a second insulation film 108 onto said storage electrode;

Art Unit: 2871

forming interlayer insulation films 109 onto regions above said gate electrode and said storage electrode;

simultaneously removing said interlayer insulation film of a contact hole portion and said interlayer insulation film above said storage electrode (items 110, 111 and 112 in Fig. 2A); and

simultaneously forming a source electrode 116 and a drain electrode 117 which are connected to said source region and said drain region, and an electrode which is extended from the wiring 117 on said second insulation film (col. 4, lines 5-12),

wherein said second insulation film is formed to an upper portion and a side portion of said gate electrode simultaneously with said step of forming the second insulation film onto said storage electrode;

wherein said second insulation film is an insulation film made of silicon oxide, an organic material (col. 3, lines 29-33); and

wherein said island-shaped semiconductor layer is an island-shaped polysilicon layer (col. 3, lines 12-28).

Zhang also discloses that by setting a suitable etching condition, a silicon nitride film can be used for the second insulating film as an etching stopper (col. 3, lines 34-40). Accordingly, the relative permittivity of said second insulation film is higher than that of said first insulation film which is made of silicon oxide (col. 3, lines 15-18).

Finally, in Fig. 2A, Zhang discloses an oxide layer formed on a storage electrode 207 (col. 4, lines 26-35).

Zhang discloses a manufacturing method of an image display that is basically the same as that recited in claims 1-5, 10, 14 and 15 except for etching said second insulation film except for upper surfaces and side surfaces of said gate electrode and said storage electrode. As shown in Figs. 5A-5D, Hwang discloses a manufacturing method of an image display comprising the steps of:

forming a plurality of island-shaped semiconductor layers 30 onto a substrate 100;

forming a first insulation film 40 onto said island-shaped semiconductor layers;
forming a gate electrode 51 and a storage electrode 10 onto said first insulation film;

forming a source region 31, a drain region 32, and a channel region 33 sandwiched between them onto said island-shaped semiconductor layers;

forming a second insulation film 60 onto said storage electrode; and
patterning the second insulation film 60 together with the first insulation film 40 to expose the source region 31 and the drain region 32 (see Fig. 5D and col. 4, lines 53-60),

wherein said first insulation film and said second insulation film are made of silicon nitride (SiN_x) which is a high dielectric constant material (col. 4, lines 33-36 and 53-56).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the manufacturing method of Zhang with the teaching of Hwang by etching said second insulation film except for upper surfaces and

Art Unit: 2871

side surfaces of said gate electrode and said storage electrode before forming the interlayer insulating film so as to simplify the fabricating process (col. 1, lines 45-48).

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (USPN 5,814,529) in view of Hwang (USPN 6,545,730 B1) as applied to claims 1-5, 10, 14 and 15 above and further in view of Tanabe et al. (USPN 5998838).

The liquid crystal display (LCD) device of Zhang as modified in view of Hwang above includes all that is recited in claim 6 except that the first insulation film is not a laminate film of a silicon oxide film and a high dielectric constant film. As shown in Fig. 1(b), Tanabe discloses a thin film transistor comprising a gate insulating layer which is a laminate film of a first layer 5 formed of silicon dioxide and a second layer 6 formed of silicon nitride which is higher permittivity than silicon dioxide so as to improve the electrical properties of the interface between the semiconductor layer and the adjacent gate insulating layer as well as to gain a desired MOS capacitance without thinning the gate insulating layer down to a minimum (col. 9, lines 1-9). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the LCD device of Zhang with the teaching of Tanabe by forming the first insulation film as a laminate film of a silicon oxide film and a high dielectric constant film so as to improve the electrical properties of the interface between the semiconductor layer and the adjacent gate insulating layer and to reduce the threshold value in operating the thin film transistor.

Art Unit: 2871

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (USPN 5,814,529) in view of Hwang (USPN 6,545,730 B1) as applied to claims 1-5, 10, 14 and 15 above and further in view of Jung et al. (USPN 6,317,173 B1).

The liquid crystal display (LCD) device of Zhang as modified in view of Hwang above includes all that is recited in claim 7 except for a parallel capacitor. As shown in Figs. 19 and 20, Jung discloses a liquid crystal display comprising a parallel capacitor including:

a first capacitor constructed by a polycrystalline silicon layer 200, a first insulation film 300, and a storage electrode 420; and a second capacitor constructed by said storage electrode, a second insulation film 500 and an innerlayer insulation film 700 which is formed on said storage electrode, and a pixel electrode 800 (col. 3, lines 48-59), wherein the first insulating layer may be made of SiO₂ and the second insulating layer may be made of SiN_x (col. 6, lines 35-39 and 57-59) for obtaining a sufficient storage capacitance for the display (col. 24, lines 30-34). As known in the art, the relative permittivity of SiN_x (=7) is higher than that of SiO₂ (=4). Accordingly, the first insulation film and the second insulation film can be made of a same high dielectric constant material (SiN_x).

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the LCD device of Zhang with the teaching of Jung by forming an additional capacitor constructed by a polycrystalline silicon layer, a first insulation film, and a storage electrode so as to obtain a sufficient storage capacitance for the display.

6. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang (USPN 5,814,529) in view of Hwang (USPN 6,545,730 B1) as applied to claims 1-5, 10, 14 and 15 above and further in view of Hara et al. (USPN 6,046,790).

The liquid crystal display (LCD) device of Zhang as modified in view of Hwang above includes all that is recited in claims 8 and 9 except for a frame memory. As shown in Figs. 10-12, Hara discloses a LCD device comprising a frame memory 35 provided in a pixel and constructed by a capacitor 3 and a switch 5 formed on a substrate in order to temporarily store image data (col. 30, lines 5-9) so as to obtain a fast response speed for the display (col. 31, lines 1-13). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the LCD device of Zhang with the teaching of Hara by forming a frame memory constructed by a capacitor and a switch so as to obtain a fast response speed for the display.

Allowable Subject Matter

7. Claims 11-13 are allowed.

The following is an examiner's statement of reasons for allowance: none of the prior art of record fairly suggests or shows all of the limitations as claimed. Specifically,

Re claim 11, none of the prior art of record discloses, in combination with other limitations as claimed, each of the capacitors having a storage electrode of the same layer as that of the gate-lines; a second insulation film formed in contact with said storage electrode, an upper surface of said interlayer insulation film, and a side surface of the opening formed in said interlayer insulation film; and an electrode which is formed

Art Unit: 2871

on the second insulation film so as to be in contact therewith and which exists in the same layer as that of said signal-lines.

The most relevant reference, USPN 5,814,529 of Zhang and USPN 6,493,046 B1 of Ueda, fail to disclose or suggest a storage capacitor comprising a second insulation film formed in contact with the storage electrode, an upper surface of the interlayer insulation film, and a side surface of the opening formed in said interlayer insulation film. The Zhang's reference only discloses a second insulation film 108 formed in contact with the storage electrode 107 as shown in Figs. 1A-1E. Meanwhile, as shown in Fig. 1, the Ueda's reference discloses a storage capacitor comprising a storage electrode 17a formed at the same layer as that of semiconductor layer 17, a dielectric layer 18a formed in contact with the storage electrode 17a, and an storage counter electrode 19a formed on the dielectric layer; however, the structure of this storage capacitor is different from that of the present invention in which the storage electrode is formed at the same layer as that of the gate-lines and the storage electrode is formed at the same layer as that of signal-lines.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

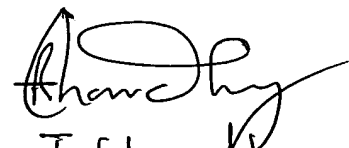
Art Unit: 2871

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thoi V. Duong whose telephone number is (703) 308-3171. The examiner can normally be reached on Monday-Friday from 8:00 am to 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim, can be reached at (703) 305-3492.

Thoi Duong
10/03/2003


T. Chandhry
Primary Examiner